MISCELLANEOUS CHROMOSOME COUNTS OF WESTERN AMERICAN PLANTS — III

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In this series of papers, chromosome counts of randomly gathered western American plants are reported as part of the Intermountain Flora Project and the Southwest Flora Project. These reports will be presented from time to time by Reveal and various others of his colleagues or students. The present paper covers miscellaneous plants gathered by Reveal, primarily as a part of his monographic studies of *Eriogonum,* and by Spellenberg through his efforts on the Southwest Flora. Spellenberg presents some additional counts from the Pacific Northwest, California and Mexico. Most of the counts reported herein are from collections made during field work for our monographic or floristic studies, and many are from rather remote areas which have not been previously cytologically sampled. Many of the counts reported in broadly based studies such as this are first reports for a species, valuable in one respect by adding a bit of data to our understanding of the plant kingdom and in another by helping to strengthen or question relationships among species proposed through other types of studies. Equally important, our counts should confirm most others scattered in the literature, at the same time filling in gaps in the known cytogeography of a species. Those that contradict earlier counts indicate possible areas for further cytotaxonomic study, uncovering problems which might otherwise remain hidden, or suggest outright errors.

Reveal's methods for preparing his counts have been summarized in the first two parts of this series (Reveal & Styer, 1973a, 1973b). For Spellenberg, flower buds were collected from plants growing in native habitats and were fixed in modified Carnoy's solution (4 chloroform: 3 ethanol: 1 glacial acetic acid) and stored in the refrigerator. Anthers were stained and squashed according to the hydrochloric acid-carmine method (Snow, 1963). Mitotic counts were made from root tips of seed collected in the field and germinated on moist filter paper. They were fixed and stained by the above method except that root tips of *Carlowrightia* were first treated with an aqueous solution of paradichlorobenzene and those of *Abutilon, Menodora* and *Oxytropis* were chilled for several hours; both treatments serve to contract the chromosomes.

Chromosome numbers of 47 species and varieties are reported here. We have reviewed the standard indices for chromosome numbers and according to these sources and our knowledge of the more recently published reports, 31

LEGEND FOR FIGURES

Fig. 1: *Carlowrightia linearifolia,* $2n = 36$ — mitotic metaphase in root tip. Fig. 2: *Amaranthus palmeri,* $n = 17$ — metaphase I. Fig. 3: *Oplopanax horridum,* $n = 24$ — anaphase I. Fig. 4: *Baileya multiradiata,* $n = 16$ — diakinesis. Fig. 5: *Gutierrezia glutinosa,* $n = 4$ diakinesis. Fig. 6: *Hulsea vestita,* $n = 19$ — ½ of anaphase II configuration. Fig. 7: *Pectis angustifolia* var. *angustifolia,* $n = 12 + 1$ — diakinesis, arrow indicates a fragment or extra chromosome. Fig. 8: *Pectis papposa* var. *grandis,* $n = 12$ — diakinesis. Figs. 9, 10: *Pseudoclappia arenaria,* $n = 18$ or 19 — metaphase I. Fig. 11: *Pediocactus simpsonii* var. *robustior,* $n = 11$ — metaphase I. Fig. 12: *Lupinus concinnus* var. *concinnus,* $n = 24$ — metaphase I. Fig. 13: *Lupinus sierra-blancae,* $n = 24$ — diakinesis. Fig. 14: *Melilotus albus,* $n = 8$ — metaphase II. Figs. 15, 16: *Oxytropis lambertii* var. *bigelovii,* $2n = 32$, $n = 16$ — mitotic metaphase from root tip and diakinesis respectively. Fig. 17: *Sphaerophysa salsula,* $n = 8$ — metaphase I. Fig. 18: *Trifolium macrocephalum,* $n = 1_{IV} + 14_{II}$ — metaphase I (arrow indicates IV). Fig. 19: *Ribes bracteosum,* $n = 8$ — diakinesis. Fig. 20: *Phacelia coerulea,* $n = 11$ — diakinesis.


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of the 47 counts reported here represent the first counts reported for the taxon, with those for *Carlowrightia, Nemacladus* and *Sphaerophysa* the first for these genera. All counts are documented by herbarium specimens. All but one of the vouchers for Reveal's counts are deposited at US, while those of Spellenberg are at NMC unless otherwise indicated by the usual herbarium abbreviation (Lanjouw & Stafleu, 1964). In the list, species for which we believe chromosome numbers are reported for the first time are preceded by an asterisk. Unless otherwise noted, all other counts confirm those reported by others. We are indebted to Norman Weatherly, an undergraduate student, for making his counts available for our use.

ACANTHACEAE

**Carlowrightia linearifolia* (Torr.) A. Gray. $2n = 36$. Fig. 1. This is believed to be the first count published for *Carlowrightia*. Many genera of Acanthaceae have a series of chromosome numbers without a common divisor. The number $n = 18$ appears several times in the family, but in light of the situation in other genera, it is not necessarily to be expected that all other species of *Carlowrightia* will have this number or be even polyploids of it. The voucher is *R. & M. Spellenberg* 1945, Doña Ana Mountains about 15 miles north of Las Cruces on a bajada south of Summerford Mountain, Doña Ana Co., New Mexico, 14 September 1968.

AMARANTHACEAE

Amaranthus palmeri S. Wats. $n = 17$. Fig. 2. This count confirms those of Grant (1958). The voucher is *Spellenberg* 2881, weed at University Ave. and Chaparral St., Las Cruces, Doña Ana Co., New Mexico, 30 June 1972.

ARALIACEAE

Oplopanax horridum (J. E. Smith) Miq. $n = 24$. Fig. 3. This count agrees with Taylor and Brockman (1966). The voucher is *R. & M. Spellenberg* 1672, Boulder Creek, about 2 miles east of Hazel, Snohomish Co., Washington, 20 May 1967.

ASTERACEAE

Baileya multiradiata Harv. & Gray. $n = 16$. Fig. 4. This report confirms those made by other investigators (see Bolkhovskikh, et al., 1969). The count, made by N. Weatherly, has as its voucher *Weatherly* s.n., 2.5 miles north of Las Cruces, Doña Ana Co., New Mexico, 7 July 1973.

Gutierrezia glutinosa (Schauer) Sch.-Bip. $n = 4$. Fig. 5. This report confirms those made by other investigators (see Bolkhovskikh, et al., 1969). The voucher is *Spellenberg* 2911, 9 miles north of U.S. Highway 70-82 on the road to Jornada del Muerto, about 12 miles north of Las Cruces, Doña Ana Co., New Mexico, 6 September 1972.

Hulsea vestita A. Gray. $n = 19$. Fig. 6. This count agrees with the count made by Raven and Kyhos (1961). The voucher is *R. & M. Spellenberg* 2878, on pumice flats 13.5 miles east of U.S. Highway 395 along California Highway 120, near the Crooked Meadows Road, Mono Co., California, 26 June 1972.

Pectis angustifolia Torr. var. *angustifolia*. $n = 12 + 1$. Fig. 7. Turner and Flyr (1966) report this entity simply as $n = 12$, but as this collection grew sympatric with *P. papposa* A. Gray var. *grandis* Keil, the irregular chromosome complement may be a reflection of possible occasional hybridization. The voucher is *Spellenberg* 2916, about 15 miles north of Las Cruces on bajada east of Summerford Mountain in the Doña Ana Mountains, Doña Ana Co., New Mexico, 22 September 1972.

Pectis papposa A. Gray var. *grandis* Keil. $n = 12$. Fig. 8. This count confirms that of several authors for *P. papposa* (see Bolkhovskikh, et al., 1969). We are not certain if any of those counts is based on a representative of this newly proposed variety. The voucher is from the same area as above, only *R. & M. Spellenberg* 2149, 14 September 1969.

Pseudoclappia arenaria Rydb. $n = 18$ or 19. Figs. 9, 10. This count is in accordance with a report of $n = 18 \pm 1$ made by Powell and Turner (1963) from a population from Reeves Co., Texas, approximately 150 miles to the southeast of this locality. In the smears observed in our count, 19 figures were most commonly seen at metaphase 1, with 18 figures being slightly less common. In those with 19 figures however, no one figure could be certainly identified as a univalent. At other stages chromosomes tended to clump and accurate counts could not be made. An occasional anaphase I bridge was evident.

CACTACEAE

**Pediocactus simpsonii* (Engelm.) Britt. & Rose var. *robustior* (Coult.) Marshall. $n = 11$. Fig. 11. The voucher is *R. & M. Spellenberg* 1646, 13 miles west of Vantage along U.S. Highway 10, Kittitas Co., Washington, 22 April 1967.

FABACEAE

**Lupinus concinnus* Agardh. var. *concinnus*. $n = 24$. Fig. 12. The voucher is *R. & M. Spellenberg* 2977, Doña Ana Mountains, about 15 miles north of Las Cruces on a bajada west of Summerford Mountain, Doña Ana Co., New Mexico, 1 April 1973.

**Lupinus sierra-blancae* Woot. & Standl. $n = 24$. Fig. 13. The voucher is *R. & M. Spellenberg* 3345, 1 mile below ski area on Sierra Blanca, Lincoln Co., New Mexico, 8 July 1973.

Melilotus albus Lam. $n = 8$. Fig. 14. This count agrees with numerous others reported in the literature (see Bolkhovskikh, et al., 1969). The count, made by N. Weatherly, has as its voucher *Weatherly* s.n., near Doña Ana, Doña Ana Co., New Mexico, 7 July 1973.

**Oxytropis lambertii Pursh* var. *bigelovii* A. Gray. $2n = 32$. Fig. 15. The only other known count for this species is $2n = 48$ from a population of var. *lambertii* gathered in Saskatchewan (Ledingham, 1957). The voucher is *R. & M. Spellenberg* 1998, Cox Canyon, 20 miles southeast of Apache Creek, Catron Co., New Mexico, 15 October 1968. $n = 16$. Fig. 16. This voucher is *R. & M. Spellenberg* 2094, roadside at Alpine, Apache Co., Arizona, 14 August 1969.

**Sphaerophysa salsula* (Pall.) DC. $n = 8$. Fig. 17. This report is believed to be the first for the genus. The species, introduced into the United States from central Asia nearly 50 years ago, commonly goes under the name of *Swainsonia salsula* (Pall.) Taub. in Engler & Prantl in floristic treatments for the western United States. Barneby (1964) recognized it as *Sphaerophysa,* where it is the typical species in the genus. *Swainsonia* in the strict sense is Australian; all counts reported for *Swainsonia* are $n = 16$ and are based on Australian and New Zealand plants (see references in Bolkhovskikh, et al., 1969). The count, made by N. Weatherly is based on *Weatherly* s.n., 3 miles north of Las Cruces, Doña Ana Co., New Mexico, 7 July 1973.

Tephrosia cana Brandeg. $n = 11$. Not figured. This count agrees with that made by Wood (1949). The voucher is *Spellenberg et al.* 3338, 2 miles east of Cabo San Lucas, Baja California Sur, Mexico, 5 June 1973.

Trifolium macrocephalum (Pursh) Poir. $n = 16$ ($1_{IV} + 14_{II}$). Fig. 18. Subsequent stages of meiosis in most cells were normal with clear counts of $n = 16$ in opposite halves of anaphase I. About 10% of the anaphase I figures, however, showed a bridge, indicating the probable presence of an inversion in addition to the translocation indicated by quadrivalent at meiosis I. Pollen from the voucher specimen has 88% of the grains stainable (counts based on 200 grains) in aniline-blue in lactophenol, indicating highly directed meiosis (Snow & Dunford, 1961). This count from a single plant gives, of course, no indication of the frequency of the translocation heterozygotes in the population, and hence the possible adaptive advantage of these heterozygotes. Snow and Dunford (1961) point out, however, that in perennial organisms with limited population size in which they must maintain a fair degree of tolerance to possible short-term unfavorable conditions, the selective advantage that might be enjoyed by the heterozygotes could be rather large. Gillett and Mosquin (1967) also report $n = 16$, ca. 16 and ca. 84 for three separate popula-

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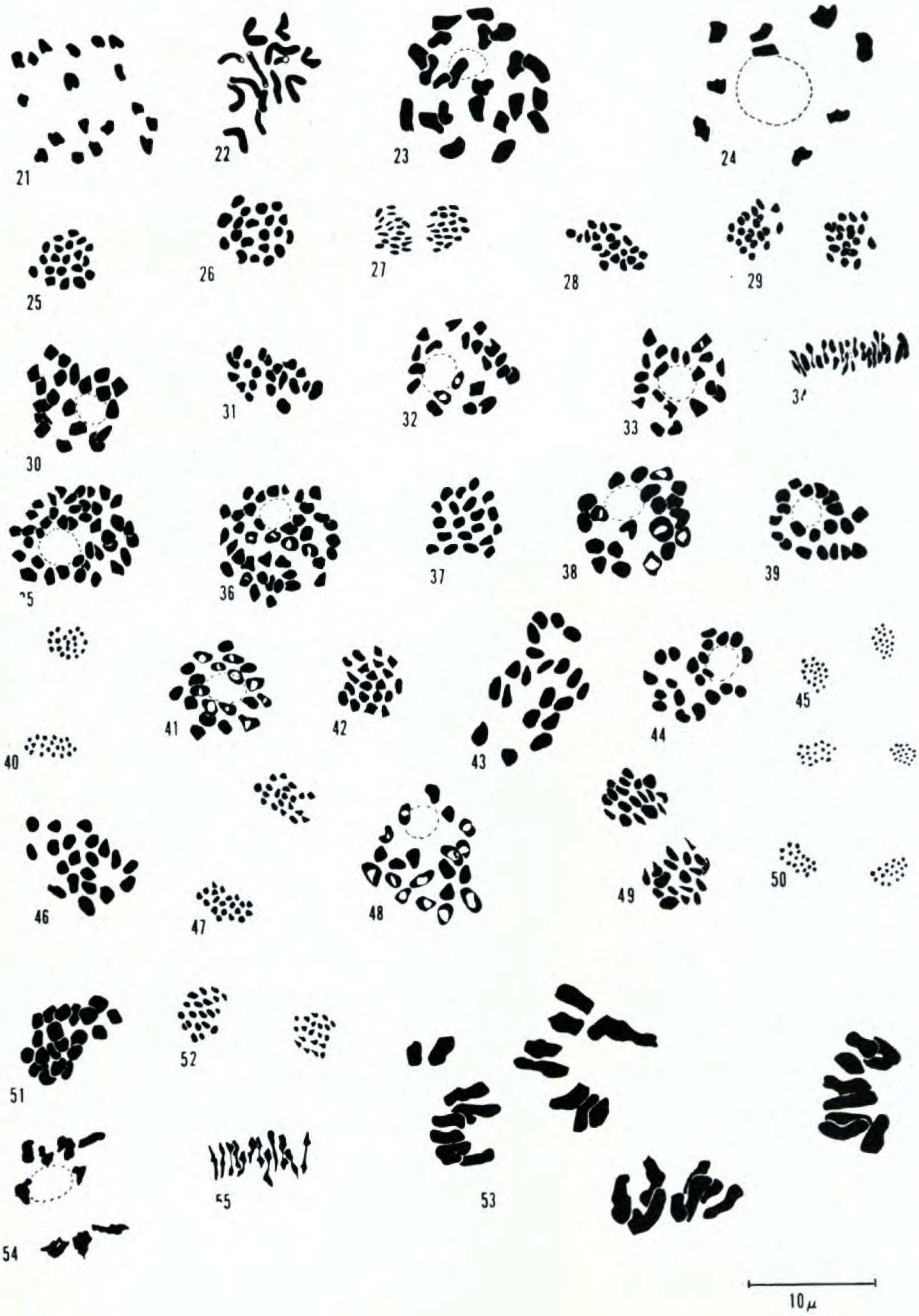
Fig. 21: *Nemacladus capillaris*, $n = 9$ — anaphase I. Fig. 22: *Abutilon malacum*, $2n = 14$ — mitotic metaphase from root tip. Fig. 23: *Menodora scabra*, $2n = 22$ — mitotic late prophase in root tip. Fig. 24: *Panicum sphaerocarpon*, $n = 9$ — diakinesis. Fig. 25: *Eriogonum apiculatum*, $n = 20$ — metaphase I. Figs. 26, 27: *Eriogonum batemanii*, $n = 20$ — metaphase I and anaphase I respectively. Figs. 28, 29: *Eriogonum corymbosum* var. *corymbosum*, $n = 20$ — metaphase I and anaphase I respectively. Fig. 30: *Eriogonum corymbosum* var. *glutinosum*, $n = 20$ — diakinesis. Fig. 31: *Eriogonum davidsonii*, $n = 20$ — metaphase I. Fig. 32: *Eriogonum gypsophilum*, $n = 20$ — diakinesis. Figs. 33, 34: *Eriogonum havardii*, $n = 20$ — diakinesis and metaphase I respectively. Fig. 35: *Eriogonum jamesii* var. *undulatum*, $n = 40$ — diakinesis. Fig. 36: *Eriogonum kearneyi*, $n = 40$ — diakinesis. Fig. 37: *Eriogonum lancifolium*, $n = 20$ — metaphase I. Figs. 38, 39, 40: *Eriogonum leptocladon* var. *papiliunculi*, $n = 20$ — diakinesis (38 and 39) and telophase I respectively. Figs. 41, 42: *Eriogonum leptophyllum*, $n = 20$ — diakinesis and metaphase I respectively. Fig. 43: *Eriogonum lonchophyllum*, $n = 20$ — metaphase I. Figs. 44, 45: *Eriogonum molestum*, $n = 20$ — diakinesis and anaphase I respectively. Fig. 46: *Eriogonum mortonianum*, $n = 20$ — metaphase I. Fig. 47: *Eriogonum nudum* var. *pauciflorum*, $n = 20$ — telophase I. Fig. 48: *Eriogonum pelinophilum*, $n = 20$ — diakinesis. Figs. 49, 50: *Eriogonum racemosum*, $n = 18$ — anaphase I and telophase II respectively. Fig. 51: *Eriogonum rupinum*, $n = 20$ — metaphase I. Fig. 52: *Eriogonum smithii*, $n = 20$ — late anaphase I. Fig. 53: *Delphinium amabile*, $n = 8$ — anaphase II. Fig. 54: *Lutkea pectinata*, $n = 9$ — diakinesis. Fig. 55: *Castilleja peirsonii*, $n = 12$ — metaphase I.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tions of *T. macrocephalum* located considerably to the east and south of the population counted and reported here. The presence of high polyploid on the one hand, and the observations of translocations on the other, indicate that a thorough cytogenetic study of this species throughout its range may be rewarding. The voucher for this count is *Spellenberg* 1667, 3 miles east of Virden along Washington Highway 131, Kittitas Co., Washington, 13 May 1967. (NY).

GROSSULARIACEAE

Ribes bracteosum Dougl. ex Hook. $n = 8$. Fig. 19. This count agrees with that reported by Zielinski (1953). The voucher is *R. & M. Spellenberg* 1675, 3 miles north of Barlow Pass on Mountain Loop Road, Snohomish Co., Washington, 20 May 1967 (WTU).

HYDROPHYLLACEAE

Phacelia coerulea Greene. $n = 11$. Fig. 20. The count agrees with others reported in the literature (see Bolkhovskikh, et al., 1969). The voucher is *R. & M. Spellenberg* 2978, Doña Ana Mountains, about 15 miles north of Las Cruces, on bajada west of Summerford Mountain, Doña Ana Co., New Mexico, 1 April 1973.

LOBELIACEAE

**Nemacladus capillaris* Greene. $n = 9$. Fig. 21. Chromosome numbers with a base of 9 are not particularly frequent in the Campanulaceae or Lobeliaceae, and if consistent within *Nemacladus* would further underscore the distinctness of this genus. The vouchers for this new generic count are *Spellenberg & Jackson* 2835, 5.9 miles west of Barlett Springs, Lake Co., California, 26 May 1972, which is figured, and *Spellenberg & Jackson* 2838, 2.9 miles east of Bartlett Springs, 27 May 1972, which is not figured.

MALVACEAE

**Abutilon malacum* S. Wats. $2n = 14$. Fig. 22. This count is in accordance with the diploid number reported for other species of the genus and apparently is the basic number. The voucher is *R. & M. Spellenberg* 1950, Doña Ana Mountains, about 15 miles north of Las Cruces, on the south slope of Summerford Mountain, Doña Ana Co., New Mexico, 14 September 1968.

OLEACEAE

Menodora scabra A. Gray. $2n = 22$. Fig. 23. Lewis et al. (1962) also report $2n = 22$ for this species from a collection made in Big Bend National Park of Texas. However, Taylor (1945) reports $2n = 44$ for the same species from a collection made at the Soil Conservation Service Nursery, Tucson, Arizona. This may be another instance of different polyploid races occupying the Sonoran and Chihuahuan deserts. The voucher is *R. & M. Spellenberg* 1948, Doña Ana Mountains, about 15 miles north of Las Cruces, on the south side of Summerford Mountain, Doña Ana Co., New Mexico, 14 September 1968.

POACEAE

Panicum sphaerocarpon Ell. $n = 9$. Fig. 24. This count agrees with others (see Bolkhovskikh, et al., 1969). The voucher is *Spellenberg* 2752, 60 miles south of Tuxtepec and 39 miles north of Ixtlan de Juarez along Oaxaca Highway 175, Oaxaca, Mexico, 13 January 1972.

POLYGONACEAE

**Eriogonum apiculatum* S. Wats. $n = 20$. Fig. 25. The voucher is *Reveal & Reveal* 2861, San Jacinto Mountains, 4.4 miles north-northwest of Idyllwild along California Highway 243, Riverside Co., California, 9 August 1972.

**Eriogonum batemanii* M. E. Jones. $n = 20$. Figs. 26, 27. The voucher is *Reveal & Reveal* 2781, San Rafael Swells, along Interstate Highway 70 about 29 miles west of Green River, Emery Co., Utah, 16 July 1972.

**Eriogonum corymbosum* Benth. in DC. var. *corymbosum*. $n = 20$. Figs. 28, 29. The voucher is *Reveal & Reveal* 2875, 6.5 miles west of Mt. Carmel Junction, along Utah Highway 15, Kane Co., Utah, 12 August 1972.

**Eriogonum corymbosum* Benth. in DC. var. *glutinosum* (M. E. Jones) M. E. Jones. $n = 20$. Fig. 30. The voucher is *Reveal & Reveal* 2887, 12 miles northeast of Henrieville, along Utah Highway 12, Garfield Co., Utah, 13 August 1972.

**Eriogonum davidsonii* Greene. $n = 20$. Fig. 31. The voucher is *Reveal & Reveal* 2862, San Jacinto Mountains, near Alandale Ranger Station, Riverside Co., California, 9 August 1972.

**Eriogonum gypsophilum* Woot. & Standl. $n = 20$. Fig. 32. This is one of the rarest species of *Eriogonum*, known only from a small number of collections. It seems to be related to the *E. brevicaule* Nutt. complex which occurs far to the north. As the name implies, it is restricted to the gypsophyllous hills which occur in the type area, but repeated searches of similar sites elsewhere have failed to reveal this plant. The voucher is *Reveal* 2949, at milepost 49.6 along U.S. Highway 285, about 16 miles north of Carlsbad, Eddy Co., New Mexico, 8 September 1972.

**Eriogonum havardii* S. Wats. Figs. 33, 34. The voucher is *Reveal* 2951, gathered in the same place as *E. gypsophilum* noted above.

Eriogonum jamesii Benth. in DC. var. *undulatum* (Benth. in DC.) Stokes ex Jones. $n = 40$. Fig. 35. This variety was previously reported by Reveal (1968) as $n = 20$ based on a collection from the Big Bend National Park of Texas. The new count, obtained from specimens further to the south indicate some cytogenetic separation that does not seem to be reinforced by morphological divergence. This is unusual for *Eriogonum* (see, for example Stebbins, 1942). The voucher is *Reveal & Hess* 2990, along the road toward Ignacio Zaragoza, about 16.5 miles southwest of Buenaventura, Chihuahua, Mexico, 10 September 1972.

**Eriogonum kearneyi* Tidestr. $n = 40$. Fig. 36. The voucher is *Reveal* 2894, 3 miles east of Pioche along Nevada Highway 85, Lincoln Co., Nevada, 15 August 1972.

**Eriogonum lancifolium* Reveal & Brotherson. $n = 20$. Fig. 37. The voucher is *Reveal* 2923, 5.5 miles east of Wellington, Carbon Co., Utah, 18 August 1972.

**Eriogonum leptocladon* Torr. & Gray var. *papiliunculi* Reveal. $n = 20$. Figs. 38, 39, 40. The vouchers for this count are *Reveal & Reveal* 2885, 10.4 miles east of Escalante along Utah Highway 12, Garfield Co., Utah, 13 August 1972 (fig. 38); *Reveal* 2906, 2.3 miles south of Page, Coconino Co., Arizona, 17 August 1972 (fig. 39); and, *Reveal* 2907 from 15 miles southeast of Page (fig. 40).

**Eriogonum leptophyllum* (Torr. & Gray) Woot. & Standl. $n = 20$. Figs. 41, 42. The voucher is *Reveal & Reveal* 2776, about 3.5 miles west of Ghost Ranch Museum along U.S. Highway 84, Rio Arriba Co., New Mexico, 15 July 1972.

**Eriogonum lonchophyllum* Torr. & Gray. $n = 20$. Fig. 43. The voucher is *Reveal* 2547, east of Durango at Squaw Creek near Fossett Gulch Road turnoff along U.S. Highway 160, La Plata Co., Colorado, 29 July 1971.

**Eriogonum molestum* S. Wats. $n = 20$. Figs. 44, 45. When the California species of *Eriogonum* were reviewed (Reveal & Munz, 1968), *E. molestum* S. Wats. was placed in synonymy with *E. nudum* Dougl. ex Benth. var. *pauciflorum* S. Wats. This was an error which cannot be placed on the shoulders of Munz, for he thought at the time it was wrong. After studying the species in the field, and once again reviewing the type, Reveal wishes to recognize that *E. molestum* is clearly a distinct species, not at all related to *E. nudum* but more closely allied with *E. davidsonii* Greene. This latter species has often been confused with *E. molestum*, and the two are closely related. In the field, they are most distinct and often grow together in the San Jacinto Mountains. The voucher for this count is *Reveal & Reveal* 2866, 6.5 miles northwest of Alandale Ranger Station along California Highway 243, San Jacinto Mountains, Riverside Co., California, 9 August 1972.

**Eriogonum mortonianum* Reveal. $n = 20$. Fig. 46. This recently proposed species has a chromosome number that is common throughout the sect. *Corymbosa*. Its voucher is *Reveal* 2904, 4.5 miles southwest of Fredonia, Mohave Co., Arizona, 16 August 1972.

**Eriogonum nudum* Dougl. ex Benth. var. *pauciflorum* S. Wats. $n = 20$. Fig. 47. The voucher is *Reveal & Reveal* 2870, 4.3 miles north-northwest of Idyllwild, San Jacinto Mountains, Riverside Co., California, 10 August 1972.

**Eriogonum pelinophilum* Reveal. $n = 20$. Fig. 48. The voucher for this count is the type of this newly proposed species, *Reveal & Reveal* 2780, 8.6 miles west of Hotchkiss, about 11.5 miles east of Delta, Delta Co., Colorado, 16 July 1972.

**Eriogonum racemosum* Nutt. $n = 18$. Figs. 49, 50. This is a most unusual number for the perennial species of *Eriogonum* as most are $n = 20$ or 40. To date, only one other member of the sect. *Racemosa* has been counted, and that species, *E. rupinum* has a chromosome number of $n = 20$ as reported below. It is suggested that *E. racemosum* will be a unique member of this species complex in this aspect, but until *E. zionis* J. T. Howell can be reported upon, the overall picture must remain somewhat vague. The voucher is *Reveal & Reveal* 2888, Cabin Hollow area just north of Red Canyon, Garfield Co., Utah, 13 August 1972. An identical count was obtained several years ago (but questioned at the time) from a collection made by *Holmgren et al.* 2202, Scofield Canyon, Grant Range, Nye Co., Nevada, 18 July 1965. It is not figured.

**Eriogonum rupinum* Reveal. $n = 20$. Fig. 51. The voucher is *Reveal* 2798, 8.2 miles north of California Highway 168 on road to Ancient Bristlecone Pine Forest, White Mountains, Inyo Co., California, 24 July 1972.

**Eriogonum smithii* Reveal. $n = 20$. Fig. 52. The voucher is *Reveal* 2921, near Big Flat Top, San Rafael Desert, Emery Co., Utah, 18 August 1972.

PRIMULACEAE

**Primula capillaris* Holmgren & Holmgren. $n = 22$. Not figured. The voucher for the count from the newly named species is the type, *Holmgren & Reveal* 2154, Thomas Creek Canyon, Ruby Mountains, Elko Co., Nevada, 15 July 1965 (UTC).

RANUNCULACEAE

**Delphinium amabile* Tidestr. $n = 8$. Fig. 53. The voucher is *R. & M. Spellenberg* 2795, below Baboquivari Peak on the lower western slopes of the Baboquivari Mountains, Pima Co., Arizona, 16 March 1972.

ROSACEAE

Lutkea pectinata (Pursh) Kuntze. $n = 9$. Fig. 54. This count agrees with the count obtained by Packer (1964). The voucher is *R. & M. Spellenberg* 1773 west of Mt. Rainier between Klapatchee Park and San Andrews Park, Mt. Rainier National Park, Washington, 22 June 1967 (NY).

SCROPHULARIACEAE

**Castilleja peirsonii Eastw.* $n=12$. Fig. 55. The voucher is *Reveal et al.* 2791, along the shore of Moon Lake, south of French Canyon, Sierra Nevada, Fresno Co., California, 21 July 1972.

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